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REVIEWS

La science séismologique: les tremblements de terre. By F. DE MONTESSUS DE BALLORE, with an Introduction by EDUARD SUESS. Paris: Armand Colin, 1907. Pp. 579, 222 figures, maps, and plates.

In the month of January, 1906, there came from the press of Armand Colin in Paris an illustrated monograph of some five hundred pages written by the Count de Montessus de Ballore and bearing the title, *Les tremblements de terre: géographie séismologique*. This important work grew out of almost a lifetime of labor and has laid the foundations for a branch of seismological science well described in the subtitle of the work, Seismic Geography. The present volume, which is uniform in style with and somewhat larger than its forerunner, was issued in December, 1907, or less than two years subsequent to the appearance of the *Seismic Geography*.

The earlier volume discussed the distribution upon the earth's surface of all recorded earthquake shocks, of which no less than 170,000 were brought under consideration. Not only were these shocks graded and compared by earthquake provinces, but within each province the distribution of seismicity was studied by a newly derived method, and maps were prepared on which all places which had been visited by important shocks were placed in relation with one another. Further, the geological structure of each district was inquired into and the relation of the so-called epicenters to lines of fracture and faulting was pointed out.

The new volume is a treatise upon seismology in all its aspects, and is at once the most comprehensive and the most authoritative work upon the subject which has yet appeared. Dr. de Montessus is an omniverous and very careful reader of the literature of the science, and in addition to the three principal languages of the scientific world, he has brought to his aid a reading knowledge of a number of others, notably Italian, Spanish, and Russian. It is to this fact as well as to the long period during which he has been collecting the data that the comprehensiveness and the broad perspective of the work are to be ascribed. If the data of seismology have been long in the assembling, the advance of the science is all comprised within a notably brief and recent period. The present is, in consequence, a time of transition as regards both the methods of study and the

fundamental theories of seismology. *Seismological Science* is for all these reasons a work to which the future student will often be compelled to refer.

The centrum or volcanic theory of earthquakes which has so long held the stage is here relegated to the lumber-room of the science, and for it is substituted the conception that earth shocks are directly due to a mutual adjustment of sections ("compartments") of the earth's crust which are moved individually like blocks between the faults which bound them. This new view-point is made the keynote of the entire work, and again and again in the pages of *Seismological Science* it is pointed out how facts before unintelligible or in direct conflict with others are now for the first time explained and brought into harmony. To this view Professor Suess has given his indorsement in the preface, where he has used the following language:

Seismic studies have passed by the same halting-places as the other branches of our knowledge. And if, in order to reach some summit of our great mountain chains, the Alpinist crouches upon a rock, not alone for the purpose of resting but that he may launch himself to greater heights after he has regained his breath; so seismology started out from a simple and perfectly schematic conception, that of the *epicenter*, the point of the earth's surface from which the earthquake seemed to emanate, and all efforts were directed toward fixing the position of this ideal geometric point; today seismology rejects this conception as too much simplified and valuable only for the shocks due to volcanic explosions, in order that it may rise to that of mutual adjustments within the design of the terrestrial marquetry.

De Montessus' classification of earthquakes is into *macroseisms* or sensible earthquakes, *microseisms* or unfelt earthquakes registered by instruments, and *megaseisms* or destructive earthquakes; and each of these is treated in a separate part of the work. Considerable confusion now exists as to the interpretation of the terms macroseisms and microseisms, and the reviewer is of the opinion that Milne's usage, making macroseisms the more destructive earthquakes and microseisms the weaker shocks, is better supported by derivation and practicability alike, though the other view has perhaps the larger following. In the Count's usage a microseism is a megaseism examined at a distance. The term microseism as applied by de Montessus is also likely to be further confused with those pulsational movements of pendulums which arise from causes other than those which produce earthquakes.

It is impossible in a brief review like the present to discuss the many subjects which are treated in this most important monograph. It will be

interesting to recall that de Montessus' interest in earthquakes was first awakened when he was a resident in Central America giving instruction in military science. The greater part of his work has, however, been accomplished in France as a major of artillery, for much of the time upon recruiting service. The last proofs of the present work he revised in South America, where he now directs the seismological service of the Republic of Chili.

W. H. H.

Research in China. Vol. I, Pt. I: Descriptive Topography and Geology. By BAILEY WILLIS, ELIOT BLACKWELDER, AND R. H. SARGENT. Vol. I, Pt. II: Petrography and Zoölogy. By ELIOT BLACKWELDER; Syllabary of Chinese Sounds, by FRIEDRICH HIRTH. Vol. II: Systematic Geology. By BAILEY WILLIS; Atlas, by R. H. SARGENT. Washington, D. C.: Carnegie Institution, 1907.

These sumptuous volumes constitute a monumental contribution to Asiatic geology. They are signal productions not only in their substance and form, but in the fact that they are a gift of productive industry to progressive science, and a tribute of one of the newest phases of civilization to one of the oldest. They give expression also to a departure from inherited methods in that, though the work was circumscribed by limitations of time and means, and confessedly but expeditious, it was given a high degree of maturity so far as it went, with the definite expectation that other mature work, by some competent organization, will be duly fitted on to it on either hand. The territory attempted was mapped topographically as well as geologically, and both with a degree of fidelity, so far as one can judge, comparable to that of an official survey of the better order. The limitations of any survey made by such an expedition are necessarily great, but there is ground to believe that, in this case, these are chiefly limitations of area merely.

The ground covered embraced a selected tract in the province of Shantung in northeastern China, chosen because of its Cambro-Ordovician terranes, and a strip, of rather wandering course, reaching from the province of Chili in north-central China westward and southward and then southeastward, through the provinces of Shan-si, Shen-si, and Hu-peï, terminating at the lower cañon of the Yang-tsï-kiang. The formations involved range through the whole geological column, but the more notable phenomena brought to attention are those of the Cambro-Ordovician, the Siluro-Devonian, the Carboniferous, and the Tertiary-Quaternary. These are treated descriptively in Vol. I, and systematically and philosophically